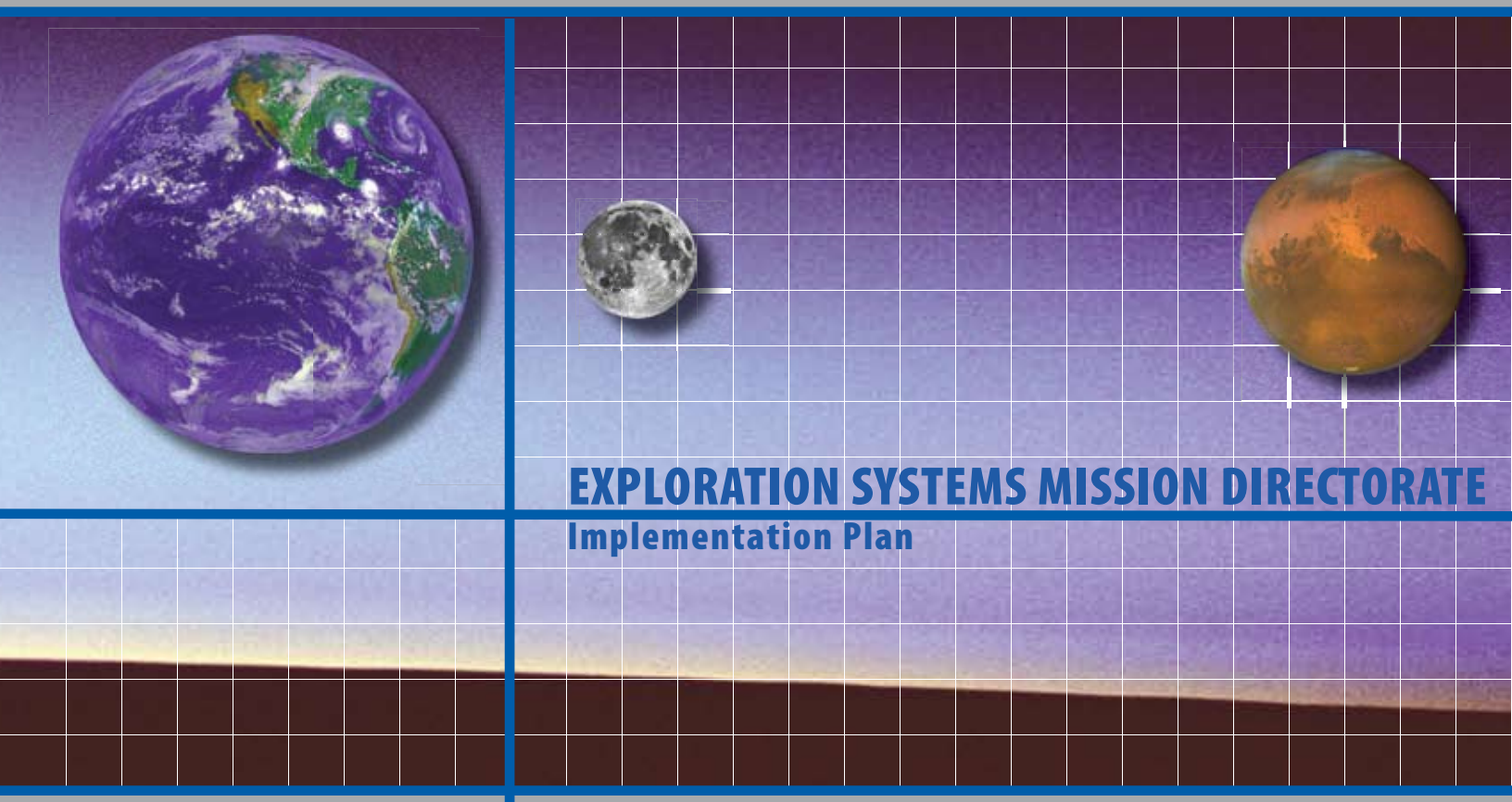
National Aeronautics and Space Administration



# EXPLORATION SYSTEMS MISSION DIRECTORATE

## Implementation Plan

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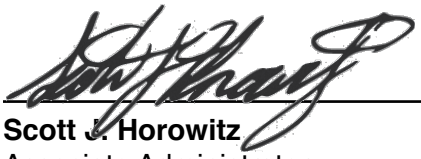
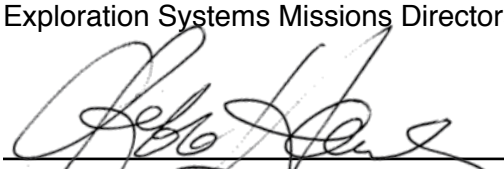
# ESMD IMPLEMENTATION PLAN: SIGNATURE PAGE

This document is an official release of the Exploration Systems Mission Directorate (ESMD). Its guidance shall be implemented by program elements of the Directorate.

## APPROVAL:

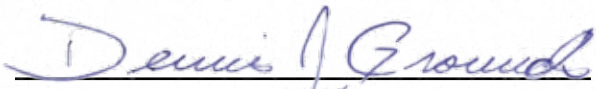


**Scott J. Horowitz**
Associate Administrator
Exploration Systems Missions Directorate

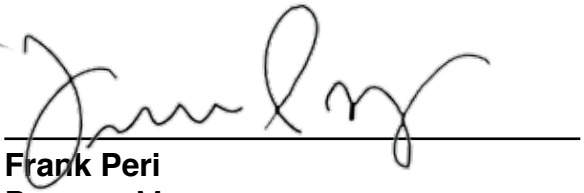


**Jeffrey M. Hanley**
Program Manager
Constellation Program

**Anthony R. Lavoie**
Program Manager (Acting)
Lunar Precursor Robotic Program



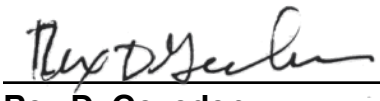
**Dennis J. Grounds**
Program Manager
(Acting)
Human Research Program



**Frank Peri**
Program Manager
Exploration Technology Development Program

**Alan J. Lindenmoyer**
Program Manager
Commercial Crew & Cargo Program

## AGENCY CONCURRENCE/APPROVAL:



**Rex D. Geveden**
Associate Administrator
National Aeronautics and Space Administration

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# A MESSAGE FROM THE ESMD ASSOCIATE ADMINISTRATOR

> **"Mankind is drawn to the heavens for the same reason we were once drawn into unknown lands and across the open sea. We choose to explore space because doing so improves our lives, and lifts our national spirit. So let us continue the journey."**
>
> — George W. Bush, Vision for Space Exploration, January 14, 2004

**Dr. Scott Horowitz**

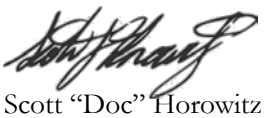
Nearly a half a century after Congress enacted the National Aeronautics and Space Act of 1958, NASA's Exploration Systems Missions Directorate (ESMD) is taking the next step in the Agency's proud tradition of exploration. As the President stated in 2004 when he set forth his Vision for Space Exploration, "We choose to explore space because doing so improves our lives, and lifts our national spirit."

The first generation of NASA reached the Moon with the Apollo program and unlocked the solar system with a rich legacy of robotic missions and satellites. Aeronautical vehicles pushed the air-space boundary and helped enable gains in aerospace and aviation. The space shuttle and international space station mark the second generation of NASA's exploration journey. We have extended the sphere of human influence off the planet to 200 nautical miles into space. We now embark on a new generational endeavor defined by its inspirational, bold, and practical spirit. With establishment of a lunar outpost, NASA will extend human influence to another planetary body, allowing exploration of the Moon, attainment of economic and scientific benefits, and the development of the ability to continue to extend the sphere of human influence to Mars and beyond.

ESMD develops the capabilities and supporting research and technology that will enable sustained and affordable human and robotic exploration and ensure the health and performance of crews during long-duration space exploration, including robotic precursor missions, human transportation elements, and life support systems. However, this bold, new journey requires the strengths of the whole NASA team. Space operations provides the communications, operational test and evaluations, and mission operations competencies and assets. Science missions inform and are informed by our mutual solar system exploration activities. Aeronautical research underpins our ability to create new vehicles and expand our operational regimes.

The ESMD Implementation Plan communicates our approach for achieving the Agency's ambitious exploration goals. In addition, it provides NASA employees, external partners, and stakeholders with an overall understanding of the ESMD mission, goals, objectives, and priorities across the organization.

I have grown up with NASA. It has been a privilege and an honor to watch NASA accomplish the feats of Mercury, Gemini, Apollo, Surveyor, Voyager, X-15, X-29, and the long list of other notable missions. I have been blessed to participate directly in the accomplishments of the shuttle and the ISS. It has been a rare opportunity to have participated in the first and second generations of NASA, and now to be a part of the team that will help usher in the next age of human exploration. We have embarked on a dynamic, creative, and inspiring venture to advance our nation and unite with other nations as we extend the reach of human civilization to the Moon, Mars, and beyond. Through our collective commitment, NASA will shape the future into reality.



Scott "Doc" Horowitz
Associate Administrator
Exploration Systems Missions Directorate

# PURPOSE

The purpose of the Exploration Systems Mission Directorate (ESMD) Implementation Plan is to communicate to its stakeholders, both internal and external to NASA, the ESMD mission, goals, and implementation of its objectives across the agency. The ESMD Implementation Plan also serves as the bridge between NASA's strategic plan and ESMD program execution by setting the framework within which the Mission Directorate will manage and execute its programs.

# SCOPE

The ESMD Implementation Plan identifies and describes the:

- ESMD mission and strategic implementation approach
- ESMD guiding principles and context for implementing its responsibilities
- ESMD organization and key interfaces and responsibilities, including specific planned performance outcomes and objectives to achieve the Agency's strategic goals
- ESMD framework for performance management

# APPLICABLE DOCUMENTS

- A Renewed Spirit of Discovery: The President's Vision for U.S. Space Exploration, February 2004
- The NASA Authorization Act of 2005
- 2006 NASA Strategic Plan (NPD 1001.0)
- NASA Strategic Management and Governance Handbook (NPD 1000.0)
- NASA Organization (NPD 1000.3)
- NASA Program/Project Management (NPD 7120.4)

# ESMD MISSION

**ESMD's mission is to develop a sustained human presence on the Moon, to promote exploration, commerce, and U.S. preeminence in space, and to serve as a stepping stone for the future exploration of Mars and other destinations.**

The ESMD mission is derived from the President's Vision for Space Exploration (referred to as the Vision), which commits the United States to implement a sustained and affordable human and robotic program to:

- Explore the solar system and beyond.
- Extend human presence across the solar system, starting with a human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations.
- Develop the innovative technologies, knowledge, and infrastructures both to explore and to support decisions about future destinations for human exploration.
- Promote international and commercial exploration participation to further U.S. scientific, security, and economic interests.

In December 2005, Congress incorporated the Vision into U.S. law through the NASA Authorization Act of 2005. The Act states that "The NASA Administrator shall establish a program to develop a sustained human presence on the Moon, including a robust precursor program, to promote exploration, science, commerce, and United States preeminence in space, and as a stepping stone to future exploration of Mars and other destinations."

The Act also directed the NASA Administrator to achieve the following milestones for which ESMD is responsible:

- Return Americans to the Moon no later than 2020
- Launch the Crew Exploration Vehicle (now known as "Orion") as close to 2010 as possible
- Increase knowledge of the impacts of long-duration stays in space on the human body using the most appropriate facilities available, including the International Space Station
- Enable humans to land on and return from Mars and other destinations on a timetable that is technically and fiscally possible

In summary and as stated in the 2006 NASA Strategic Plan, ESMD is to develop the capabilities and supporting research and technology that will enable sustained and affordable human and robotic exploration, and to ensure the health and performance of crews during long-duration space exploration. In support of the more specific near-term goal of lunar exploration, ESMD will develop robotic precursor missions, human transportation elements, and life support systems.

# ESMD STRATEGIC MANAGEMENT FRAMEWORK

## NASA STRATEGIC GOALS

The Agency has identified six strategic goals to achieve its mission. ESMD has primary responsibility for achieving three key strategic goals and has significant responsibility for achieving two others. Specific multi-year performance "outcomes" to be achieved by NASA programs and projects are established and used to measure progress toward goal attainment. The ESMD performance outcomes are identified later in this document. Figure 1 illustrates the Agency's six strategic goals.

| | |
|---|---|
| **Strategic Goal 1** | Fly the shuttle as safely as possible until its retirement, not later than 2010 |
| **Strategic Goal 2** | Complete the International Space Station in a manner consistent with NASA's International Partner commitments and the needs of human exploration |
| **Strategic Goal 3** | Develop a balanced overall program of science, exploration and aeronautics consistent with the redirection of the human spaceflight program to focus on exploration (ESMD Primary Subgoal 3F) |
| **Strategic Goal 4** | Bring a new Crew Exploration Vehicle into service as soon as possible after Shuttle retirement |
| **Strategic Goal 5** | Encourage the pursuit of appropriate partnerships with the emerging commercial space sector |
| **Strategic Goal 6** | Establish a lunar return program having the maximum possible utility for later missions to Mars and other destinations |

**ESMD Primary** **ESMD Secondary** **ESMD Primary Subgoal Only** **No ESMD Involvement**

**Figure 1 - NASA's Strategic Goals**

## A STRATEGY FOR EXPLORATION – MOON, MARS, AND BEYOND

The ESMD led an international effort to develop a global exploration strategy that reflects the interests of the Agency's partners and stakeholders: international space agencies, academia, and commercial investors. This strategy of partnership planning and development is focused currently on human and robotic exploration of the Moon, while keeping evolution to Mars and other destinations as an objective. The detail of these evolved initiatives will unfold over the next several years.

Figure 2 illustrates the ESMD planning process. The components of the global exploration strategy framework include the development of Lunar Exploration themes and objectives that address the following questions: Why are we returning to the Moon, and what do we hope to accomplish through lunar exploration?

The themes provide the high-level rationale for exploring the Moon, and a framework for capturing the interests of a diverse community of stakeholders. The Objectives describe the potential value of lunar exploration as a set of discrete activities that could be accomplished by future explorers.

**Artist Concept of Future Lunar Expeditions**

Starting with this comprehensive set of themes and objectives, NASA has initiated a process to determine what the Agency's highest priority objectives are based on the direction outlined in the Authorization Act of 2005, 2006 NASA Strategic Plan, and other sources. Beginning in 2006, NASA also established a Lunar Architecture maturation process to assess the implementation implications of NASA's priority objectives. NASA's goal is to establish high-level lunar architecture requirements that can be traced to these priority objectives.

Stakeholders around the world are using this same comprehensive set of lunar objectives to identify their own priorities. Through this process, NASA, international space agencies, and commercial investors of complementary interests will be able to identify areas where where mutually beneficial collaborative agreements may be developed. In addition, ESMD will continue to provide leadership to the Global Exploration Strategy (GES) Team as international space agencies work to coordinate their individual lunar exploration efforts to provide the highest benefit and safest operating environment to all explorers.

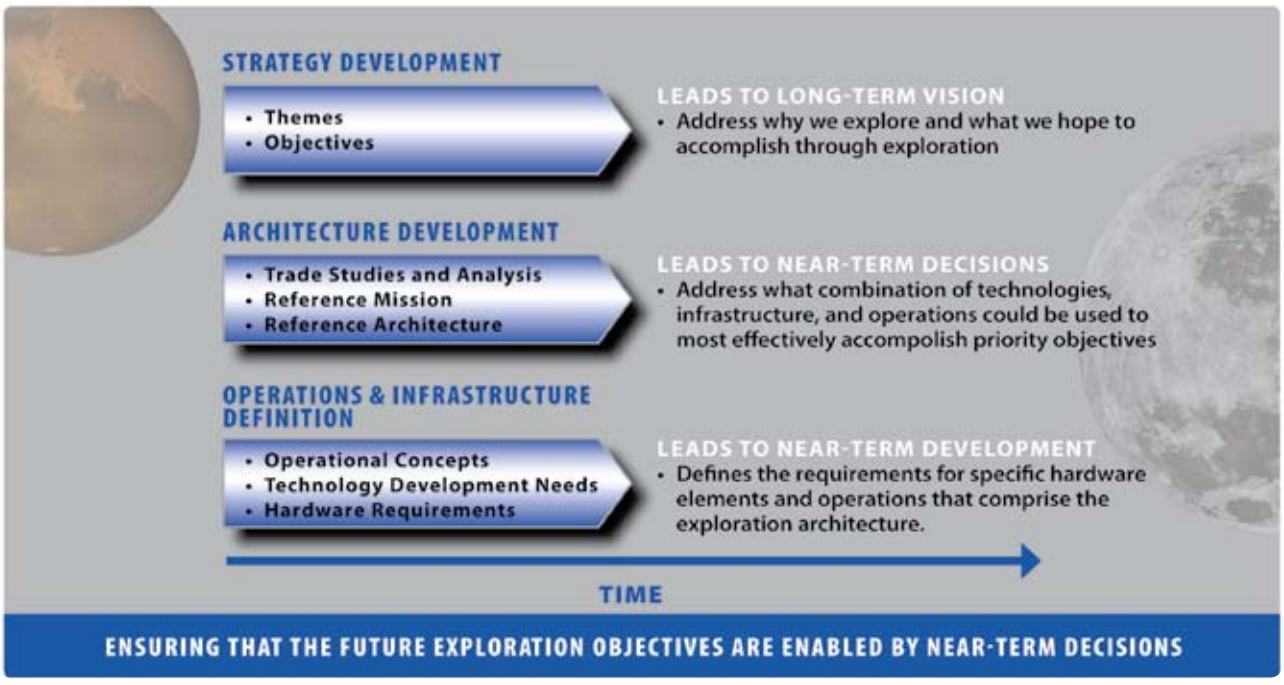



**Figure 2 — Strategic Planning to Inform Tactical Decisions**

As NASA's lunar architecture matures, ESMD will develop the next level of requirements to address the operational concept, technology development areas, and specific hardware needed to support lunar missions. As the global exploration strategy evolves, ESMD will work with other stakeholders to identify themes and objectives for additional destinations and, following the same process as was used in 2006 to initiate lunar architecture studies, develop requirements based on these strategic inputs.

## AGENCY-LEVEL EXPLORATION IMPLEMENTATION PRINCIPLES

ESMD programs and projects will follow several implementation principles that reflect the NASA Authorization Act of 2005 and the priorities of the NASA administrator. These implementation principles are to:

- Develop and maintain the United States human space transportation capabilities
- Make life cycle cost integral to all operational and design trade analyses
- Maximize use of proven technologies, infrastructure, and workforce to meet exploration needs, to reduce mission risk, maintain expertise, and to meet or exceed schedule expectations
- Provide demonstrable progress throughout the life of the program
- Provide crew survival capabilities such as abort, escape, emergency egress, emergency medical care, safe haven, and rescue when hazard controls fail
- To the maximum practical extent, separate crew from cargo transportation for launching exploration missions
- Engage national, international, commercial, scientific, and public participation in exploration to further United States scientific, security, and economic interests

## GOVERNANCE

The ESMD governance structure ensures the effective flow of information; identifies chains of command and organizational relationships; delegates responsibility and authority, and establishes the collaboration and coordination necessary for the organization to function efficiently.

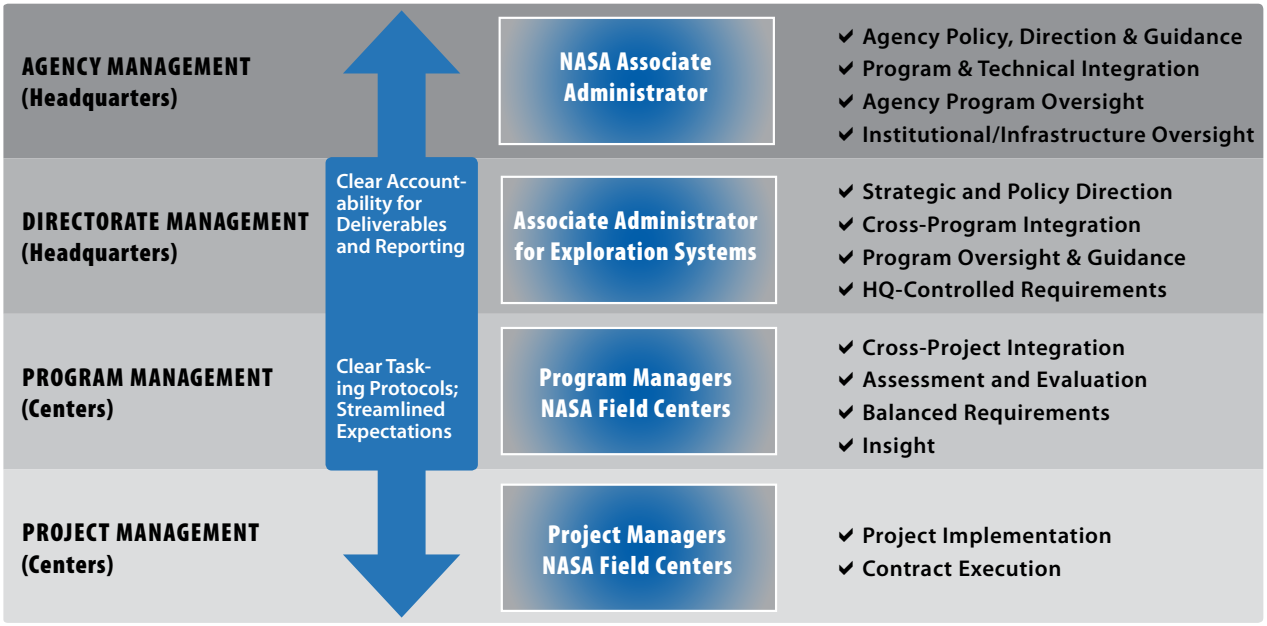



**Figure 3 — Programmatic Roles and Responsibilities**

Agency-level management councils provide the governance structure by which NASA controls all strategic management processes. There are three councils: the Strategic Management Council, the Agency Program Management Council, and the Operations Management Council. The ESMD Associate Administrator serves as a member to all three councils,

and participates in the decision-making processes to review and approve strategic planning, program commitments, and institutional budgeting. In addition, ESMD reviews and evaluates its programs and projects through a Directorate Program Management Council (DPMC) chaired by the ESMD Associate Administrator, and provides recommendations to the Agency Program Management Council in approving and evaluating programs and projects under its purview.

As programs and projects are executed, governance is implemented through NASA's strategic management framework compliant with Agency policy directives and requirements. This framework employs checks and balances between key organizations; consequently, NASA has adopted two basic authorities: the programmatic authority and the technical authority. The programmatic authority resides in the roles and responsibilities of the NASA Associate Administrator, Mission Directorate Associate Administrator, program and project managers; whereas, the technical authority resides in the roles and responsibilities of the NASA Chief Engineer, Center Directors, and the center engineers. Coordination and integration occur at each level in the programmatic and technical management chain, where both work together and provide a check and balance to achieve the Agency's missions and goals.

Agency-level management is responsible for Agency policy, direction, and guidance; program and technical integration, Agency program oversight, and institutional/infrastructure oversight. On behalf of the Administrator, the NASA Associate Administrator has primary Agency management responsibilities for both the Mission Directorates and the center directors. Directorate management is responsible for strategic and policy direction, headquarters-controlled requirements, cross-program integration, and program oversight and guidance.

ESMD program and projects are executed at the NASA Centers under the direction of the ESMD Associate Administrator. Programs are responsible for cross-project integration, assessment and evaluation, balanced requirements, and oversight. Projects also are responsible for project implementation and contract execution.

NASA Centers are responsible for establishing and maintaining the institutional and engineering capabilities required by NASA programs, projects, and missions. ESMD works collaboratively with Agency organizations on strategic management of human capital and capital assets to achieve a cost-effective and efficient approach that meets mission requirements and develops or maintains needed competencies and infrastructure.

Figure 3 illustrates the allocation of major programmatic functional roles and responsibilities within ESMD at NASA Headquarters and at the NASA Centers.

## ESMD DOCUMENT HIERARCHY

The framework within which ESMD executes and manages its responsibilities is guided by both national policy and Agency requirements. Figure 4 illustrates the ESMD document hierarchy. ESMD Implementation Plan, policies, plans, and requirements provide the basis for mission planning and implementation.

Exploration architecture requirements are being developed and will serve as the parent document for all ESMD programs. The Exploration Architecture Requirements Document (EARD) will be consistent with the ESMD Implementation Plan. ESMD program and project leaders will develop the implementation plans and requirements that flow from these directorate-level documents.

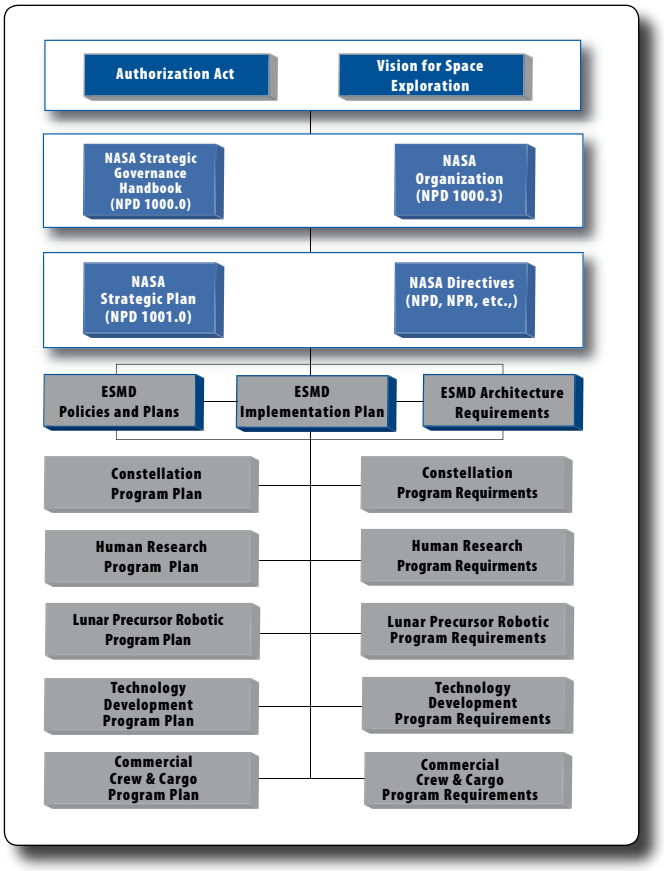



**Figure 4 — Document Hierarchy for ESMD Mission Planning and Implementation**

# STRATEGIC INTERFACES

ESMD has several strategic interfaces that are instrumental to achieving the ESMD mission and goals, including strategic interfaces within the Agency and with external entities and communities, as illustrated in Figure 5.

## Internal Interfaces

Within NASA, ESMD collaborates with the Office of the Administrator, Administrator staff offices, Mission Directorates, Mission Support Offices, and NASA Centers such as:

- ESMD works closely with the other Mission Directorates to maximize the benefits of shared and complementary expertise from the Agency's exploration and discovery activities. ESMD and the Science Mission Directorate collaborate on solar system activities of mutual interest, such as planetary and Near Earth Objects data. ESMD works closely with the Space Operations Mission Directorate as the future operator of the systems being developed and in the transition of appropriate shuttle workforce and infrastructure to the Constellation Program. ESMD also depends upon the Aeronautics Research Mission Directorate for its expertise and support in many areas including aerodynamic modeling and testing, materials and structures.
- ESMD assists Program Analysis and Evaluation in developing Agency strategies and policies, the final ESMD budget, performance plans and metrics, and evaluations and reports of ESMD progress in executing programs and projects.
- The Office of the Chief Engineer appoints a Mission Directorate Chief Engineer (MDCE) to be

the lead technical authority within ESMD. The MDCE serves as a technical advisor to the ESMD Associate Administrator. The MDCE is an integral member of the ESMD senior management team and a member of the Directorate Program Management Council (DPMC). The MDCE provides oversight of engineering policy and standards, including systems engineering policy and requirements review. The MDCE also provides technical oversight at the architecture-level for requirements, technical assessment, inter-program assessment, and risk management. The MDCE is co-located with ESMD.

- The ESMD Office of Safety and Mission Assurance representative serves as a member of various safety teams (e.g. human rating plan, systems requirement review planning), is a member of the DPMC, and is a key contributor to ESMD project document reviews by providing an integrated perspective across the programs and projects.
- ESMD representatives interface with the staff of the Office of the Chief Health and Medical Officer (OCHMO). OCHMO ensures the health and safety of NASA employees in space and on the ground by developing health and medical policy, establishing guidelines for health and medical practice in the Agency, providing oversight of health care delivery, assuring professional competency NASA-wide, and reviewing and approving research requirements and deliverables. The OCHMO establishes space flight crew health standards to the Human Research Program for research to meet crew health, safety, and performance. The Constellation Program works with OCHMO to ensure that crew medical care requirements are addressed at all phases of vehicle development and utilization. The OCHMO is also a member of the DPMC.

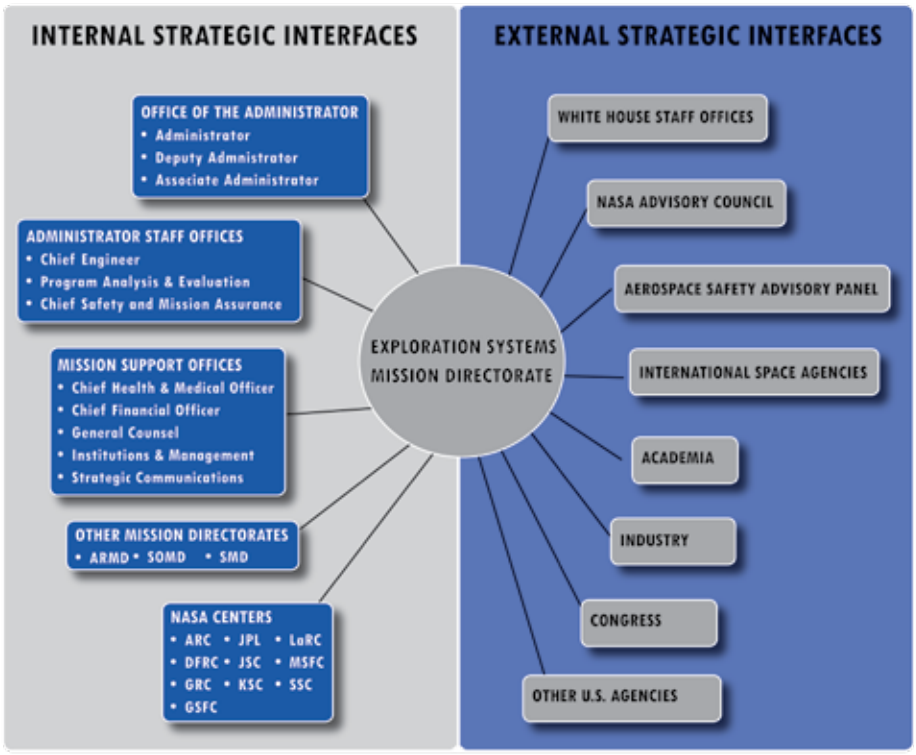



**Figure 5 — ESMD Agency Strategic Interfaces**

## External Interfaces

ESMD is committed to engaging and collaborating on space exploration and the global exploration strategy with other federal agencies, other space agencies, academia, industry, and the public. The Mission Directorate:

- Develops and maintains productive relationships with other federal agencies, including the Department of Defense, the Department of Energy, the National Science Foundation, and the National Institutes of Health through working groups and Space Act Agreements.
- Maintains memberships in international working groups, negotiates collaborative programs and projects, and participates in a wide variety of international forums for strategic planning and tactical implementation.
- Engages the academic community in diverse areas, including biomedical and physical sciences research proposal solicitation and review, technology development, engineering, and information systems, as well as training programs for undergraduate, graduate, and postdoctoral students.
- Continues to include and rely on the Agency's industrial/commercial partners in the development of exploration systems, services, and plans, as well as in conducting trade studies and overall implementation of the exploration mission.
- Regularly meets with representatives of the White House Office of Management and Budget and the Office of Science and Technology Policy as well as the Department of State and Congress, to discuss ESMD strategic and tactical plans, program and project progress, and performance.
- Interfaces with and provides an Executive Secretary to support the NASA Advisory Council (NAC) Exploration Committee which advises the NASA Administrator on ESMD activities.

# ESMD ORGANIZATIONAL RESPONSIBILITIES

ESMD Associate Administrator (AA) is primarily responsible for managing programs within the Mission Directorate, assigning and recommending program and project assignments, and serving as the Mission Directorate decision authority. In addition, the AA is responsible for all program requirements including budgets, schedules, and the high-level programmatic requirements levied on projects within the Mission Directorate. ESMD divisions support the ESMD AA by providing

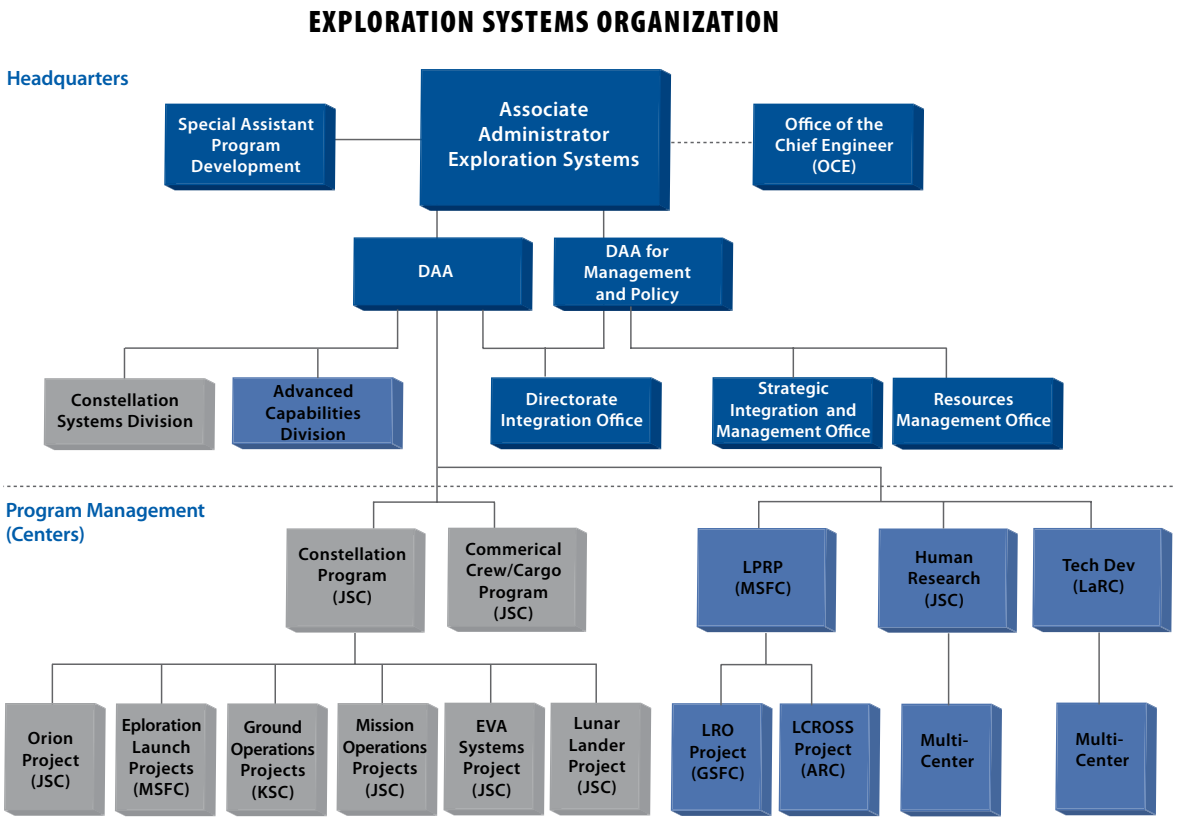



**Figure 6 — Exploration Systems Organization**

oversight in defining, integrating, and assessing program and project activities and providing policy direction and guidance to the program and project.

ESMD is making full use of the Agency's human capital expertise with its programs, projects, elements, and integration responsibilities distributed across all NASA Centers. At NASA headquarters, ESMD establishes priorities and policies, integrates across the Agency, and communicates with stakeholders in the legislative and executive branches and other external stakeholders. Figure 6 depicts the Mission Directorate organizational structure.

## CONSTELLATION SYSTEMS DIVISION

The Constellation Systems Division (CxSD) portfolio includes the Constellation Program and the Commercial Crew and Cargo Program. CxSD responsibilities include providing insight and recommendations on the programs and projects under its purview to the ESMD Associate Administrator; coordinating top-level budget activities; representing and advocating for the program at headquarters; collaborating with other Mission Directorates; and facilitating the transition of appropriate shuttle infrastructure and workforce to the Constellation Program. In addition to the broad responsibilities stated, CxSD also provides insight and support on major acquisitions; performs directorate-level systems engineering and integration (SE&I) and test and validation (T&V); and coordinates facility and infrastructure planning. CxSD works closely with the ESMD Special Advisor for Acquisition, NASA's Office of Procurement, and the Office of General Counsel.

**Artist's rendering of the Ares V Cargo Launch Vehicle.**

In conducting its responsibilities, CxSD engages in key collaborative relationships with Advanced Capability Division programs, other Mission Directorates and external stakeholders, the Office of Chief Health and Medical Officer, the Technical Authority (Mission Directorate Chief Engineer), Office of Chief Engineer, and Office of Safety and Mission Assurance.

### Constellation Program and Projects

The Constellation Program (CxP), located at Johnson Space Center (JSC), is responsible for developing a safe, affordable, and sustainable system to conduct human exploration across the solar system. Flight systems for development will include crew vehicles, launch vehicles, lunar vehicles, lunar surface systems, ISS crew/cargo systems, communication systems, and mission support systems.

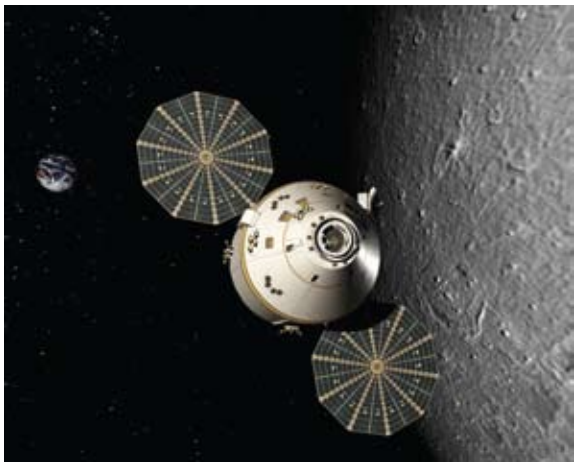
The CxP has the responsibility and authority to plan and execute its program as delegated by the ESMD Associate Administrator per NPR 7120.5. This includes managing and integrating all Constellation Program projects and elements, in addition to managing program funding and integrated scheduling. [Specific program and project responsibilities are outlined in NPR 7120.5.]

The CxP is currently comprised of the major projects identified below. Additionally, the CxP conducts pre-project formulation activities for future exploration systems. This includes the destination surface systems such as habitats, power systems, rovers, science payload interfaces, robotic systems and resource utilization systems that enable the crew members to live, work, and explore. As the CxP matures, these pre-project activities will be transitioned to projects, which will manage the development of those additional

systems. The primary systems that make up the Constellation architecture include:

- Crew Exploration Vehicle, named "Orion"
- Crew and Cargo Launch Vehicles, named "Ares I" and "Ares V"
- Ground Operations
- Mission Operations
- Lunar Lander
- Extravehicular Activity Systems

Project Orion, managed at JSC, consists of the following system elements: a service module, crew module, spacecraft adaptor and launch abort system.



**Orion Concept (Courtesy of Lockheed Martin)**

The Exploration Launch Office at the Marshall Space Flight Center manages the Ares I and Ares V projects, which include the earth departure stage. The Ground Operations project, managed at the Kennedy Space Center, includes the ground facilities, facility systems, and ground support equipment that support receipt, testing, integration, processing, and launch of the exploration spacecraft. The project also manages crew and return vehicle recovery at the primary, alternate, and contingency landing sites.

The Mission Operations project, managed at JSC, includes mission systems and flight operations. Mission systems is the facility capability development (control center, planning systems, training facilities, and mockups) that fully supports Constellation design, development, test, and evaluation. Flight operations is currently developing the production process for recurring flight operations.

The Extravehicular Activities Systems Project Office, managed out of JSC, includes the systems and elements necessary to protect and allow for effective work of crewmembers in vacuum and thermal environments which exceed the human capabilities. This includes development of EVA systems for all mission phases during all mission phases.

## Commercial Crew and Cargo Program Office

The Commercial Crew & Cargo Program Office (C3PO) is located at the Johnson Space Center, and manages commercial orbital transportation service capability demonstration projects. This is the first time NASA has sought non-government vehicles and commercial services to provide crew and cargo transportation for human space flight. Demonstrations of capability will occur between 2008 and 2010.


**COTS Award Winners**

Once a capability is demonstrated, the Agency can purchase these services competitively. As commercial enterprises turn the journey to low-Earth orbit into a profit-making business model, NASA will be able to focus on goals that are more appropriate for government, such as exploration of the Moon and Mars. As the Exploration program unfolds, NASA's partnerships with the commercial space industry may ultimately extend beyond meeting the needs of the ISS and low earth orbit to support future exploration ventures to the Moon, Mars, and beyond.

# ADVANCED CAPABILITIES DIVISION

The Advanced Capabilities Division (ACD) portfolio includes the Lunar Precursor Robotic Program, Human Research Program, and Exploration Technology Development Program. These ACD programs and their projects provide technology development through prototype demonstration in a relevant environment, known as technology readiness level 6. ACD also provides operational and technical risk mitigation for Constellation Programs through the Lunar Precursor Robotic Program. ACD maintains management insight and provides recommendations to the ESMD Associate Administrator on its portfolio. The ACD works with the Constellation Program to assure that research, technology, and precursor missions provide critical information and capabilities to enable human exploration missions.

In conducting its responsibilities on behalf of the ESMD AA and in support of its technology and scientific programs, ACD engages in key collaborative relationships with the other Mission Directorates, Office of the Chief Health and Medical Officer, Office of Chief Engineer, and Office of Safety and Mission Assurance. ACD also serves as facilitator and strategic communicator between its ESMD programs and Congress, the National Academy of Sciences, the Departments of Defense and Energy, and the industrial and academic communities, both domestic and foreign.

### Lunar Precursor Robotic Program

The Lunar Precursor Robotic Program (LPRP) is managed by Marshall Space Flight Center, and its primary customer is the Constellation Program. The overarching goal of LPRP is to gather the information required to support and enable future human lunar exploration missions. Data returned by LPRP missions will also have substantial scientific value that will lead to advances in understanding the history of the solar system.

**Lunar Reconnaissance Orbiter (LRO)**

LPRP will provide an early assessment of human exploration targets on the Moon through deployment of the Lunar Reconnaissance Orbiter (LRO) mission, scheduled for launch in 2008. LRO will create a high-resolution, global topographic map and geodetic grid; assay lunar resources; survey potential landing sites; and characterize lunar radiation environments. LRO data will be used to develop a risk mitigation strategy for both technology developments and the development and subsequent emplacement of supporting infrastructure. The Lunar Crater Observing Sensing Satellite (LCROSS) is co-manifested with LRO, and will, with high accuracy, investigate the presence of water ice on the Moon. The LCROSS will target the upper stage of the launch vehicle to impact a permanently-shadowed crater at the south pole of the Moon, gather imagery of the resulting ejecta cloud, and characterize the lunar regolith in the ejecta cloud.

LPRP will develop capabilities to characterize radiation, thermal, and lighting environments to support a human presence on the lunar surface for both short and long-duration stays. Lunar data will be collected and utilized to determine how best to support longer human visits to the Moon.

### The Human Research Program

The goal of the Human Research Program (HRP) located at the Johnson Space Center is to provide the human health and performance countermeasures, knowledge, technologies, and tools required to enable safe, reliable, and productive human space exploration. Specific objectives of HRP include developing capabilities, countermeasures, and technologies needed to support human space exploration (focusing on

mitigating the highest risks to crew health and performance), and defining and improving human spaceflight medical, environmental, and human factors standards.

Kenneth Bowersox Participates in the Foot / Ground Reaction Forces During Spaceflight Experiment on the ISS.

In addition, HRP will develop technologies that serve to decrease medical and environmental risks, to reduce human systems resource requirements, and to ensure effective human-system integration across exploration systems. The HRP will work with its customers to maintain competencies necessary to support exploration risk reduction in the areas of space medicine, physiological and behavioral effects of long duration spaceflight on the human body, space environmental effects (including radiation) on human health and performance, and space human factors. The HRP customers are ESMD, Office of the Chief Health and Medical Officer, and Space Operations Mission Directorate.

Program elements include space radiation, human health countermeasures, exploration medical capability, behavioral health and performance, space human factors, and ISS medical project and habitability.

## Exploration Technology Development Program

**ATHLETE, a six-legged rover that could be used during lunar habitat construction.**

Located at Langley Research Center, the Exploration Technology Development Program (ETDP) will develop new technologies that enable future human and robotic exploration missions and reduce mission risk and cost. ETDP will develop and mature innovative technologies to technology readiness level 6 in time to support the target system's preliminary design review. The primary ETDP customers are the Constellation Program and the Lunar Precursor Robotic Program (LPRP).

ETDP will develop technologies to support current and future Constellation and LPRP mission requirements. Major technology areas include structures, thermal protection systems, non-toxic propulsion, power production and management, thermal control, avionics and software, mission operations and robotics, in-situ resource utilization, life support, systems design and analysis tools, and lunar dust characterization and mitigation.

ETDP also coordinates research and technology development efforts in the areas of basic and applied research, and nuclear power and propulsion.

**Artist's Concept of Future Lunar Outpost**

Basic and applied research may be conducted on the ISS, free flyer flight experiments, and/or through ground-based research that is not directly related to human exploration. This research is in the areas of microgravity effects on fluid physics, combustion, and fundamental biological

processes. The goals of these basic and applied research activities are to maintain the U.S. scientific expertise and research capabilities. The primary customers for this research are the domestic life and physical science and technology development communities.

NASA's nuclear power and propulsion efforts focus primarily on developing cost-effective fission surface power systems to provide the higher energy and power needed to enable long-duration stays on lunar and Martian surfaces. The Advanced Capability Division works closely with the Department of Energy and its laboratories to implement these research and development efforts that will be needed to support the Constellation Program.

## STRATEGIC INTEGRATION AND MANAGEMENT OFFICE

The Strategic Integration and Management Office (SIMO) promotes exploration by leading the development of strategies and partnerships, communicating to NASA's stakeholders, and effectively managing organizational needs in a collaborative and cooperative work environment. The SIMO division performs these functions through four primary teams – management and strategy, communications, education and human resource administration and management.

SIMO oversees all aspects of strategic policy and management and development of interagency, international, and commercial collaborations relying on inputs from ESMD architecture and program needs. SIMO leads or provides the support necessary for making programmatic, business, management, and strategic decisions across the Directorate. It also ensures effective implementation of management direction and coordination of strategic and operational issues that are of particular importance to the Associate Administrator.

SIMO provides administrative management of the Directorate Program Management Council and Management Decision Forums and strategic integration and management of the Partnership Integration Committee, Quarterly Program Management Review and Monthly Management Review. SIMO integrates ESMD strategic goals and organizational plans to ensure effective alignment and implementation; manages the work of administrative, partnership, and other appropriate personnel; coordinates center support and investments to ESMD programs; and manages outreach, legislative and education activities.

SIMO has lead liaison responsibilities with the NASA Administrator's Office, Office of Strategic Communications, Office of Legislative Affairs, Public Affairs, External Relations, Communications Planning, Congress, and Mission Support Directorates. SIMO also has key relationship responsibilities with Office of Program Analysis and Evaluation and the other Mission Directorates.

## RESOURCES MANAGEMENT OFFICE

The Resources Management Office (RMO) is responsible for working with the ESMD division offices and programs to optimize resources so that ESMD can achieve its strategic goals and objectives. The RMO manages the development of the ESMD annual budget and the related integrated performance documents, as well as the financial systems that support funds execution and budget management. The RMO utilizes and provides guidance on the appropriate rules for implementing full cost accounting for ESMD, in addition to ensuring adherence with appropriation controls. Additionally, RMO maintains the earned value management (EVM) policy, ensures consistent EVM application and reporting across programs, and serves as the ESMD interface to the Office of Chief Engineer on EVM. Resource analysts are responsible for financial and earned value analysis and must be able to analyze and translate program requirements and earned value analysis into budget requests.

The RMO provides support to the ESMD Associate Administrator in developing overall guidance, strategy, and advocacy for the ESMD budget to as well as supporting discussions with the executive branch and legislative branches of the U.S. Government. Additionally, the RMO serves as the principal directorate liaison to the Office of the Chief Financial Officer and the Independent Program Assessment Office.

## DIRECTORATE INTEGRATION OFFICE

The Directorate Integration Office (DIO) is responsible for a wide array of ESMD technical areas that require programmatic integration. DIO develops and maintains the directorate-level exploration requirements document, and oversees requirements integration across all ESMD programs, including the integration of program requirements, architecture, and trade studies. The office also conducts, tracks, and participates in architecture analysis and trade studies, and associated modeling and simulation.

DIO leads the development, evaluation and implementation of the directorate's programmatic and technology protection policies; maintains insight to program-level activities; and performs technical and programmatic analyses. DIO manages and coordinates risk and knowledge management activities across the directorate's programs and projects. The DIO also manages the ESMD Integrated Technology (IT) architecture planning, as well as performs the overall daily Directorate IT management. This office serves as the Directorate's lead liaison to the Office of the Chief Engineer and the Office of Safety and Mission Assurance, and performs technical and safety integration across ESMD program and projects. DIO is also responsible for integrating and maintaining the ESMD Research and Technology (R&T) Plan that provides the basis for the Directorate's R&T portfolio strategy.

# PERFORMANCE PLANNING AND MANAGEMENT

As leaders of the nation's exploration mission, the ESMD and its partners have much to accomplish and to communicate to its stakeholders. ESMD takes its stewardship responsibilities seriously, and is committed to being fully accountable for ensuring solid performance for the budget it receives. Historically, over eighty percent of the NASA budget is expended on products and services from industry and academia to achieve the Agency's mission; therefore, effective acquisition planning and execution are key elements of ESMD performance management. Clearly assigning authority and accountability are essential to successful teamwork and integration between ESMD and its partners.

In addition to performance accountability and authority, ESMD measures performance and provides direction as needed to ensure that mission execution remains on track. Three key strategies for effective performance planning and management include establishing and aligning ESMD performance goals with the budget, executing an effective risk management plan, and effectively utilizing earned value management.

## TRANSITION ACTIVITY

A significant part of NASA's work to achieve successful exploration program performance, in both the near and long-term, includes its ability to effectively and efficiently utilize and transition its people, knowledge, hardware, and software. The Agency views transition activity as a continuum of program and exploration support that begins with the space shuttle transition and retirement, and is followed by activities that sustain the ISS post-shuttle using the Commercial Orbital Transportation Services (COTS) program for ISS re-supply. This continuum includes the Constellation program's transition from development to operations that progresses from support of the ISS, to exploration of the Moon, Mars and beyond.

To ensure success, NASA will accomplish its transition goals through a well-integrated strategic management process that

focuses on both a tactical short-term and prudent long-term strategic business and operations processes. The plan is to forge a leaner, more efficient, and responsive Agency by focusing on evolving both its skilled workforce and aging facilities and infrastructure. To do this, transition planning activities emphasize safety, workforce, infrastructure, and budget.

### Safety, Risk Management, and Mission Success

Safety and mission success serve as fundamental decision drivers for all of NASA's current operations and developmental activities. Mission execution takes precedence over transition, yet emphasis on one cannot occur to the detriment of the other. Accordingly, the Agency will address its transition challenges in a manner that is appropriately focused on ensuring that the life cycle risks are mitigated as much as possible throughout the entire program

### Workforce

As NASA's most vital asset, its civil service and contractor team are a major transition focus. Because of this, the Agency is committed to working with its industry and research partners to retain its workforce, manage it appropriately during transition, and engage it during the gap period following Shuttle retirement in 2010 and prior to Constellation flight operations around 2014.

In addition to progress already made, the Agency will address the continuing workforce challenges of matching skills with the work to be done, managing attrition, retraining and hiring, balancing workload through conversion to temporary and term appointments, and improving workforce planning for future years.

### Infrastructure, Capital Assets, Facilities, and Real and Personal Property

Currently, the Shuttle program occupies 654 facilities, has over 980,000 equipment items, engages over 20,000 civil servants and prime contractors across the country, with an equipment acquisition value of about $12 billion and total facility replacement costs of over $5.7 billion. NASA's transition challenge resides in responsibly dispositioning this expansive facilities and property portfolio.

### Budget and Planning

NASA is developing the cost basis and projections for transition, but these will continue to change as Constellation requirements are refined, shuttle and International Space Station operations fluctuate, and unforeseen events unfold. To assist the budget process, formalized transition boards are continuing to define and measure resource utilization and disposition, including real and personal property, personnel, and processes. NASA is using a multi-integrated milestones chart to provide a single source for all significant milestones for NASA human spaceflight programs, operations, production, and facilities.

## ACQUISITION

ESMD management is actively engaged in the acquisition strategy and source selection process in accordance with the guidance set forth in the NASA Federal Acquisition Regulation Supplement. ESMD has developed an acquisition strategy policy that provides the framework for NASA Centers to use in developing the acquisition approach for ESMD programs and projects. Strategic make or buy decisions, level of penetration for oversight, and independent engineering and testing are to be explicitly and systematically defined as a part of the acquisition strategy for defining and developing exploration capabilities. Several other key ESMD acquisition strategies include:

- **Achieving cost-effective solutions through the use of a competitive acquisition process, while leveraging existing contracts and resources as appropriate.**
  In order to facilitate significant transition activities and to avoid substantial cost duplication, ESMD is using, to the maximum extent possible, existing Space Shuttle Program and International Space Station Program contracts for highly specialized services, while preserving its capability for future competitions.
- **Employing a "zero-based" approach to develop its requirements.**
  This approach stipulates that only the minimum requirement to achieve the mission objectives are identified. ESMD is acquiring industry input into those minimum requirements in order to achieve the desired outcomes.
- **Creating performance incentives that are milestone-based, and are focused on successful outcomes, cost savings, and lower life cycle costs**
  Creating incentives for cost, schedule and technical performance are being used to achieve desired outcomes. Areas of consideration include lifecycle costs, streamlining, and subcontract management. Award fee determinations are milestone-based with interim and final determinations and payment made upon successful achievement of established milestones.

Adhering to these acquisition tenets, developing effective collaborative relationships, and maintaining clear lines of responsibility and accountability should lead to safe, reliable, and affordable solutions.

## PERFORMANCE METRICS, ASSESSMENT, AND REPORTING

At the programmatic execution level, regular monitoring of progress against plan is accomplished using a formal set of metrics. ESMD measures its performance through monthly and quarterly performance management reviews. There are multiple, externally mandated requirements for performance planning, measurement, and reporting. Therefore, as part of the ESMD performance planning process, the performance metrics that are established are structured in a way that is responsive to and consistent with the Government Performance and Results Act (GPRA), the President's Management Agenda (PMA), and Office of Management and Budget (OMB) Circular A-11 requirements. GPRA and OMB Circular A-11 require all agencies to prepare annual performance plans, and link their budgets with performance. NASA provides this information annually in the Integrated Budget and Performance Document (IBPD).

The IBPD documents the Agency's annual performance goals and multi-year outcomes required for achieving the strategic goals set forth in the NASA strategic plan. At the end of the fiscal year, the Agency submits its Performance Accountability Report against the goals set forth in the IBPD. In addition to the IBPD, the PMA includes a Budget and Performance Integration Initiative. OMB established the Program Assessment Rating Tool, and uses it to evaluate program planning, management, and performance toward quantitative, outcome-oriented goals. One or more ESMD programs receive this assessment every year.

In addition to assessing program performance against these articulated goals, ESMD utilizes earned value management and effective risk management to achieve its performance goals.

### Earned Value Management

ESMD is committed to applying sound and proven management practices across all programs and projects. The Directorate will implement earned value management (EVM) to assess technical, cost, and schedule performance for its programs and projects. The ESMD EVM policy guidance has been established and provides the Mission Directorate's programs and projects with a standard set of guidelines for EVM application and reporting and defines the organizational responsibilities for its effective implementation.

| GOALS, OUTCOMES, AND OBJECTIVES | RESPONSIBLE PROGRAM | PRIMARY INTERFACE |
|---|---|---|
| **Agency Strategic Goal 2: Complete the International Space Station in a manner consistent with NASA's International Partner commitments and the needs of human exploration.** | | |
| **Outcome 2.3:** Conduct basic and applied biological and physical research to advance and sustain U.S. scientific expertise<br>• Design, build and fly ISS experiments and Free Flyer experiments.<br>• Conduct ground-based investigations that promote the development of basic and applied flight experiments | ETDP | SOMD - ISS & SSP |
| **Agency Strategic Goal 3: Develop a balanced overall program of science, exploration, and aeronautics consistent with the redirection of the human spaceflight program to focus on exploration.** | | |
| **Sub-goal 3C: Advance scientific knowledge of the solar system, search for evidence of life and prepare for human exploration** | | |
| **Outcome 3C.4**: Progress in exploring the space environment to discover potential hazards to humans and search for resources that would enable human presence. (SMD)<br>• Develop and deploy a Radiation Assessment Detector (RAD) on the Mars Science Laboratory, scheduled to fly in 2009 | ETDP | SMD - Mars Program |
| **Sub-goal 3F: Understand the effects of the space environment on human performance, and test new technologies and countermeasures for long-duration human space exploration.** | | |
| **Outcome 3F.1**: By 2008, develop and test candidate countermeasures to ensure the health of humans traveling in space.<br>• Complete development of a renal stone countermeasure and validate for use.<br>• Begin validation of bone and cardiovascular countermeasures on the ISS | HRP | SOMD - ISS, SSP; OCHMO |
| **Outcome 3F.2**: By 2010, identify and test technologies to reduce total mission resource requirements for life support systems.<br>• Complete laboratory testing of CEV candidate technolgies for carbon dioxide (C02) and humidity removal, water disinfection, and solid waste volume compaction, increasing the technology maturation in all areas. | ETDP | CxP |
| **Outcome 3F.3**: By 2010, develop reliable spacecraft technologies for advanced environmental monitoring and control and fire safety.<br>• Complete critical design review for an ISS technology demonstration of the advanced environmental monitoring system.<br>• Conduct at least two experiments on the ISSS to advance next-generation technologies for fire prevention, detection, and suppression on spacecraft. | ETDP | SOMD - ISS; CxP |
| **Agency Strategic Goal 4: Bring a new Crew Exploration Vehicle into service as soon as possible after Shuttle retirement** | | |
| **Outcome 4.1**: No later than 2014, and as early as 2010, transport three crewmembers to the International Space Station and return them safely to Earth, demonstrating an operational capability to support human exploration missions.<br>• Design, develop, test, and produce a lunar-capable CEV that provides transportation to and from the Earth's surface<br>• Design, develop, test, and produce a human-rated Crew Launch Vehicle that provides transportation from the Earth's surface to Low Earth Orbit (LEO).<br>• Design, develop and implement the ground infrastructure required to support pre-launch, launch and recovery of sytstem elements.<br>• Design, develop, and implement flight operations infrastructure appropriate to support misssion execution.<br>• Design, develop, test, and produce EVA nd crew survival systems. | CxP | SOMD - ISS &SSP |

**Figure 7: ESMD Performance, Outcomes and Objectives**

| GOALS, OUTCOMES, AND OBJECTIVES | RESPONSIBLE PROGRAM | PRIMARY INTERFACE |
|---|---|---|
| **Outcome 4.2**: By 2010, successfully transition applicable shuttle components, infrastructure, and workforce to the Constellation program.<br>• Develop and implement a shuttle infrastructure and workforce transition plan that effectively utilizes agency-wide resources.<br>• As needed, transition control of Shuttle and Space Station infrastructure at Kennedy Space Center and Johnson Space Center to the Constellation Program for appropriate modifications. | CxP | SOMD - SSP |
| **Agency Strategic Goal 5: Encourage the pursuit of appropriate partnerships with the emerging commercial space sector.** | | |
| **Outcome 5.2**: By 2010, demonstrate one or more commercial space services for ISS cargo and/or crew transport.<br>• Conduct demonstrations of cargo and crew services.<br>• Following successful capability demonstrations, acquire commercial cargo and/or crew transport services to support the ISS. | C3PO | SOMD - ISS |
| **Agency Strategic Goal 6: Establish a lunar return program having the maximum possible utility for later missions to Mars antd other destinations.** | | |
| • **Outcome 6.1**: By 2008, launch a Lunar Reconnaissance Orbiter (LRO) that will provide information about potential human exploration sites.<br>• Complete the Non-Advocate Review (Authority to Proceed) for the LRO.<br>• Complete the Critical Design Review, Mission Operational Review, and Payload Engineering Review for the LRO. | LPRP | SOMD - Space Comm; CxP |
| **Outcome 6.2**: By 2012, develop and test technologies for in-situ resource utilization, power generation, and autonomous systems that reduce consumables launched from Earth and moderate mission risk.<br>• Demonstrate the feasibility of extracting volatiles and oxygen from lunar regolith in a laboratory environment<br>• Demonstrate remote supervision of a robotic system to deploy and set up lunar surface infrastructure in a laboratory environment | ETDP | LPRP & CxP |
| **Outcome 6.3**: By 2010, identify and conduct long-term research necessary to develop nuclear technologies essential to support human-robotic lunar missions and that are extensible to exploration of Mars.<br>• Develop and select at least one viable and affordable concept system design for lunar fission surface power and continue essential hardware-based research activities.<br>• Begin development and testing of technologies for nuclear power systems to enable an informed selection of systems for flight development to provide power to a lunar outpost. | ETDP | CxP, LPRP |
| **Outcome 6.4**: Implement the space communications and navigation architecture responsive to Science and Exploration mission requirements.<br>• Develop the Command, Control and Communications and Information (C3I) architecture that allows all Constellation elements to communicate seamlessly with one another.<br>• Modify existing ground communications infrastructure to support the ECANS C31 architecture. | CxP | SOMD - Space Comm |
| **Outcome 6.5**: No later than 2020, demonstrate the capability to conduct an extended human expedition to the lunar surface and lay the foundation for extending human presence across the solar system.<br>• Design, develop, test and produce a lunar surface access spacecraft that provides crew and cargo transportation to and from the lunar surface.<br>• Design, develop, test and produce a heavy lift launch vehicle to support the launch of exploration elements.<br>• Design, develop, test and implement lunar surface systems that provide a capability to conduct lunar surface exploration in preparation for future Mars expeditions.<br>• Define the Mars exploration architecture requirements to enable human expeditions to Mars and beyond. | ESMD | SMD & SOMD |

**Figure 7: ESMD Performance, Outcomes and Objectives**

### Current ESMD Performance Outcomes and Objectives

The current ESMD performance outcomes and objectives that support the Agency strategic goals are identified in Figure 7. Collaboration and integration are essential to achieving the Mission Directorate's outcomes and the agency's strategic goals; therefore, the ESMD program with primary responsibility for achieving each outcome is identified along with the primary collaborating program and/or Mission Directorate.

### Integrated Risk and Knowledge Management

ESMD employs an integrated risk and knowledge management approach that is implemented across and between the Directorate, program, and project levels. The integrated risk and knowledge management processes, roles and responsibilities are defined in the ESMD Risk Management Plan. All performing organizations reporting to ESMD must comply with the requirements specified in this plan and manage the risks under the purview using the Continuous Risk Management (CRM) Process – a continuous, iterative process that identifies, analyzes, plans, tracks, controls, communicates, and documents risk through all life-cycle phases of an organization's product developments.

In addition, ESMD has integrated several knowledge management best practices into the risk management process: 1) A "Pause and Learn" process, which is an adaptation of the Army's After Action Review methodology; 2) Secure Communities of Practice, which are meaningful forums for creating, storing, and transferring knowledge; and 3) Knowledge-based risks derived from lessons learned.

To facilitate effective and efficient managing and risk reporting, ESMD employs a common risk reporting format, a directorate-wide scoring scheme and metrics, a risk escalation process, explicit correlation between risks and their associated technical and programmatic requirements, and the requirement to integrate risk management with earned value management.

## MANAGEMENT REVIEWS AND DECISION BOARDS

The Mission Directorate uses several forums for strategy formulation, performance management and decision making as depicted in Figure 8.

ESMD uses the aforementioned governance system to formulate, approve, implement, evaluate, and govern all of its programs and projects. These systems and controls adhere to NASA Policy Directives (NPDs) and Requirements (NPRs), primarily, the NASA Program and Project Management (NPD 7120.4), and NASA Program and Project Management Processes and Requirements (NPR 7120.5). These NPDs authorize specific responsibilities, authorities, accountabilities, and controls to Mission Directorate Associate Administrators, and program and project managers, respectively.

ESMD has established a strategy development forum to ensure that the Mission Directorate functions as an integrated system in planning, formulating, negotiating and implementing partnership agreements with the non-NASA community. The "Partnership Integration Committee" (PIC) has been chartered to perform this function.

To ensure the appropriate level of program and project management oversight, NASA has established two levels of governing Program Management Councils (PMCs) per NPR 7120.5 — the Agency PMC and Mission Directorate PMCs. These PMCs are responsible for evaluating the cost, schedule, risk, and performance content of a program or project under its purview. The governing PMC makes recommendations on approval to proceed to the Agency PMC or to the appropriate

Decision Authority. ESMD accomplishes program/project oversight through the Directorate PMC (DPMC) and makes recommendations to the Agency PMC.

In addition to the DPMC, the Mission Directorate conducts monthly and quarterly management reviews to assess performance and promote integration and teamwork. To facilitate decision-making and communication on the transitioning of appropriate shuttle systems to the Constellation Program, joint ESMD-Space Operations Mission Directorate integration boards and committees have been established at multiple levels from the Mission Directorate AA level down to the working teams at the Centers.

As described above and in greater depth under the ESMD Organization section that follows, the Mission Directorate strategically manages its performance by focusing on key performance information, risks, management tools, and reporting forums.

### ESMD Directorate Program Management Council

The ESMD Directorate Program Management Council (DPMC) is the decision forum for topics relating to the planning, formulation, implementation, and evaluation of ESMD programs and projects. The DPMC also provides a forum to involve senior management in addressing issues pertaining to ESMD program and project management policy and implementation.

The ESMD DPMC, chaired by the Associate Administrator for ESMD, evaluates the integrated planning, formulation, and implementation of ESMD programs and projects to ensure that they are consistent with Agency and ESMD strategic plans and available resources, and are conducted in accordance with the established commitments. The ESMD DPMC will review and approve Directorate and program requirements; review and make recommendations regarding approval or disapproval of ESMD programs and projects proceeding to the next phase at key decision points throughout the program/project life cycle; and review, approve, and control program plans, Directorate-level policies and processes, and directorate-level information technology tools that support information management, including earned value management, risk management, and other acquisition and business processes.

The reference documents for the ESMD DPMC are NASA Policy Directives (NPD) 1000.0, NPD 7120.4 and NASA Procedural Requirements (NPR) 7120.5

### ESMD Management Decision Forum

The ESMD Management Decision Forum (MDF) meets on a weekly basis, if needed, and serves as both a decision and communication forum. The MDF complements the Directorate Program Management Council (DPMC) and addresses programmatic issues or concerns that are not within the scope of DPMC, including issues related to ESMD program and project management policy and implementation. The MDF provides a forum for multiple viewpoints on issues needing a decision by the ESMD Associate Administrator.

### ESMD Quarterly Program Management Reviews

Every quarter, the ESMD Associate Administrator conducts a management review of the programs and projects within the Directorate's portfolio. The purpose of the Quarterly Program Management Review (QPMR) is to evaluate and improve performance (cost, schedule, technical and risk), integration, and teamwork.

The attendance includes ESMD senior management as well as Center Directors and other senior management

across the Agency. Understanding the specific objectives, achievements, plans, and issues enables each member of the collective NASA team to contribute more effectively.

### ESMD Monthly Management Review

The ESMD Associate Administrator (AA) and Deputy Associate Administrator (DAA) conduct a monthly review of the performance of the ESMD organization – the divisions, including the programs and projects. The purpose of this review is to provide the ESMD senior management in-depth insight into the performance and challenges of its programs and projects, resources, integration, strategic planning and implementation. ESMD Associate Administrator decisions focus on addressing risks, issues, challenges and teamwork to optimize performance.

### ESMD Partnership Integration Committee

The ESMD Partnership Integration Committee (PIC) is a cross-directorate strategy development forum for topics pertaining to exploration-related relationships, collaborations, and agreements with the "non-NASA community." The non-NASA community is defined to include commercial organizations, other federal agencies, and other space agencies.

The PIC ensures that ESMD collaborations with the non-NASA community on exploration-related endeavors are made using a coordinated, strategic process that identifies and recommends partnership opportunities on the basis of Agency priorities and mission needs and objectives. The PIC assists with effective utilization of program resources by ensuring that collaboration pursuits are strategically aligned with ESMD and agency priorities.

Participation by the Mission Directorate's Deputy Associate Administrators (DAAs) and the DAA of the Office of External Relations helps to ensure strategic alignment, identify synergies, and leverage resources across the Agency in collaborating with the non-NASA community. The ESMD DAA for Management and Policy chairs this committee.

### ESMD-SOMD Management Boards

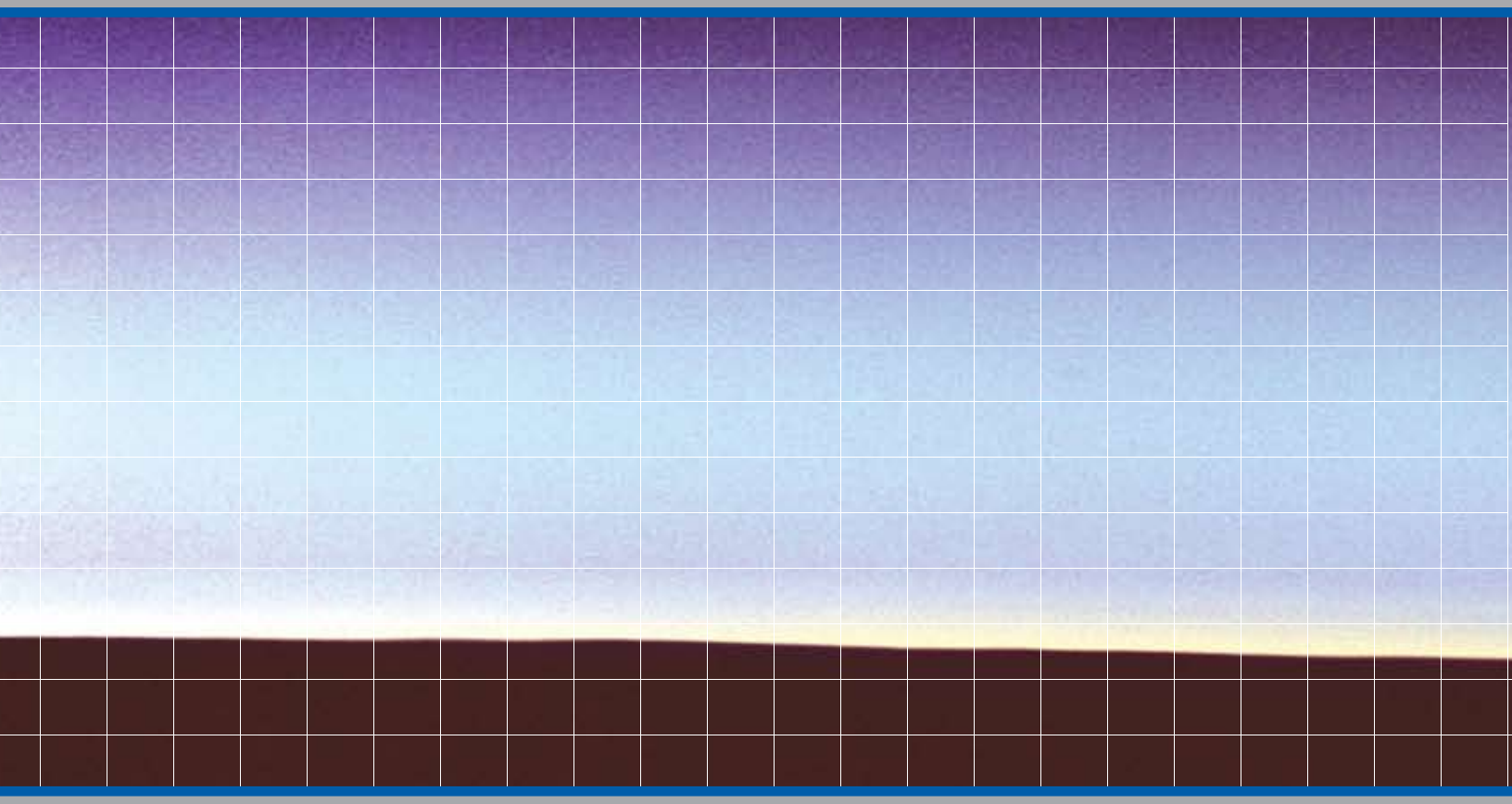
To ensure the appropriate level of communication and informed decision-making, ESMD and Space Operations Mission Directorate (SOMD) have established joint control boards and working groups from the Associate Administrator-level to those executing the work at the project level. The two ESMD-SOMD management boards are the Joint Integration Control Board and the Transition Control Board.

These joint control boards and working groups are used to provide direction on transition and overall integration issues; develop a structured, cost-effective approach to transition; manage joint risks; and jointly develop a concept of operations (i.e., ground processing, launch and landing, lunar operations). In addition, ESMD and SOMD communicate the activities surrounding the space shuttle program transition to all stakeholders. The joint ESMD and SOMD control boards also serve as an interface with the Office of Institution and Management and Office of Program and Institutional Integration to address workforce planning, construction, and disposition of facilities. The commitment of the individuals and the structure of the chartered boards facilitate the achievement of a successful transition of applicable shuttle infrastructure and workforce to the Constellation Program.

**NOTE:** The ESMD Implementation Plan will be updated periodically and is available at www.exploration.nasa.gov.

| | Management Board/Forum | Purpose | Chair | Key Members |
|---|---|---|---|---|
| agency | **Strategic Management Council (SMC)** | Establish strategic direction & assess progress at vision and mission-level | NASA Administrator | DA, AA, Administrator, Staff Directors, MD, AAs, CFO, Gen Counsel, CIO, I&M, AA, CDs |
| | **Operations Management Council (OMC)** | Review and approve institutional plans | NASA Deputy Administrator (DA) | AA, Administrator, Staff Directors, MD AAs, CFO, Gen Counsel, CIO, I&M AA, CHMO, CDs |
| | **Agency Program Management Council (APMC)** | Baseline and assess program performance; approve and review programs and projects. | NASA Associate Administrator (AA) | DA, Administrator Staff Directors, MD AAs, CFO, Gen Counsel, CIO, I&M, CDs |
| directorate | **Directorate Program Management Council (DPMC)** | Approve and review ESMD programs and projects and provide recommendations to APMC; Establish ESMD programmatic policy and Plans | ESMD Associate Administrator (AA) | ESMD HQ Management, ESMD Program Managers, OCHMO, OCE, OSMA |
| | **Management Decision Forum (MDF)** | Deals with programmatic issues or concerns that ar not appropriate for DPMC | ESMD AA | ESMD DAA, ESMD AAA, HQ Division Directors, Program Managers |
| | **Quarterly Program Management Review (QPMR)** | Review and optimize program performance; make decisions as needed | ESMD AA | ESMD HQ, ESMD Program & Project Mgmt, NASA Sr. Mgmt Invited |
| | **Monthly Management Review (MMR)** | Review and optimize performance; make decisions as needed | ESMD AA | ESMD HQ Mgmt |
| | **Partnership Integration Committee (PIC)** | Identifies and recommends partnership opportunities on the basis of Agency priorities and mission needs and objectives with non-NASA community | ESMD DAA for Management and Policy | MD AAs and the DAA for Office of External Relations |
| | **Joint Integration Control Board (JICB)** | Facilitate integration and make strategic decisions; make decisions affecting SSP and Constellation Baselines | AAs of ESMD and SOMD | I&M, OSMA |
| | **Transition Control Board (TCB)** | Plan and make tactical decisions on transition of Shuttle Program resources | AAs of ESMD and SOMD | I&M, OCE, & OSMA |

**Figure 8 — ESMD Management Review and Decision-Making Forums**



## ESMD's Mission

ESMD's mission is to develop a sustained human presence on the Moon, to promote exploration, commerce, and U.S. preeminence in space, and to serve as a stepping stone for the future exploration of Mars and other destinations.

National Aeronautics and Space Administration

**NASA Headquarters**
300 E Street, SW
Washington, DC 20546
www.nasa.gov/centers/hq

www.nasa.gov

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